The Challenges of Estimating Automated Information Systems:

An Air Force Perspective

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Briefing Purpose

- Provide an overview of some of the challenges of estimating Automated Information Systems

- Foster a discussion of the issues and discuss potential solutions

Information Superiority

- **Joint Vision 2010**
  - Requires the ability to collect, process, and disseminate a steady flow of information to US forces throughout the battlespace, while denying the enemy ability to gain and use battle-relevant information
- **Issue:** The Revolution in Military Affairs will enable our forces to attack the enemy with fewer munitions, less lift, and less collateral damage. Requires a commitment logistics, personnel, medical and other systems that support it.
- **Support Defense Reform Initiative**
  - Adopt Best Business Practices
  - Implement Internet-based Publishing
  - Consolidate Logistics and Transportation
  - Reengineer Travel System

Briefing Outline

- **Major Automated Information Systems Process/Cost Documentation**
  - Criteria for Major Automated Information Systems (MAIS) designation
  - Acquisition Reform Legislation
  - DoD 5000.2-R Updates
  - Projected improvements to process
  - Service recommendations
- **AIS Estimating Overview**
  - Typical system overview and cost elements
  - Assessment
    - General
    - Software
    - Hardware
    - Other estimating “hot spots”

Major AIS Criteria

- **OMB Circular No. A-11:**
  - Major acquisitions are those requiring special management attention because of
    - Importance to agency mission
    - High development, operating, or maintenance costs
    - High risk
    - High return
    - Significant role in the administration of agency programs, finances, property, or other resources

- **DoD 5000.2-R Cost Thresholds (FY96$)**
  - At least $30M program cost in any one year, or
  - At least $120M total program cost, or
  - At least $360M total life cycle cost

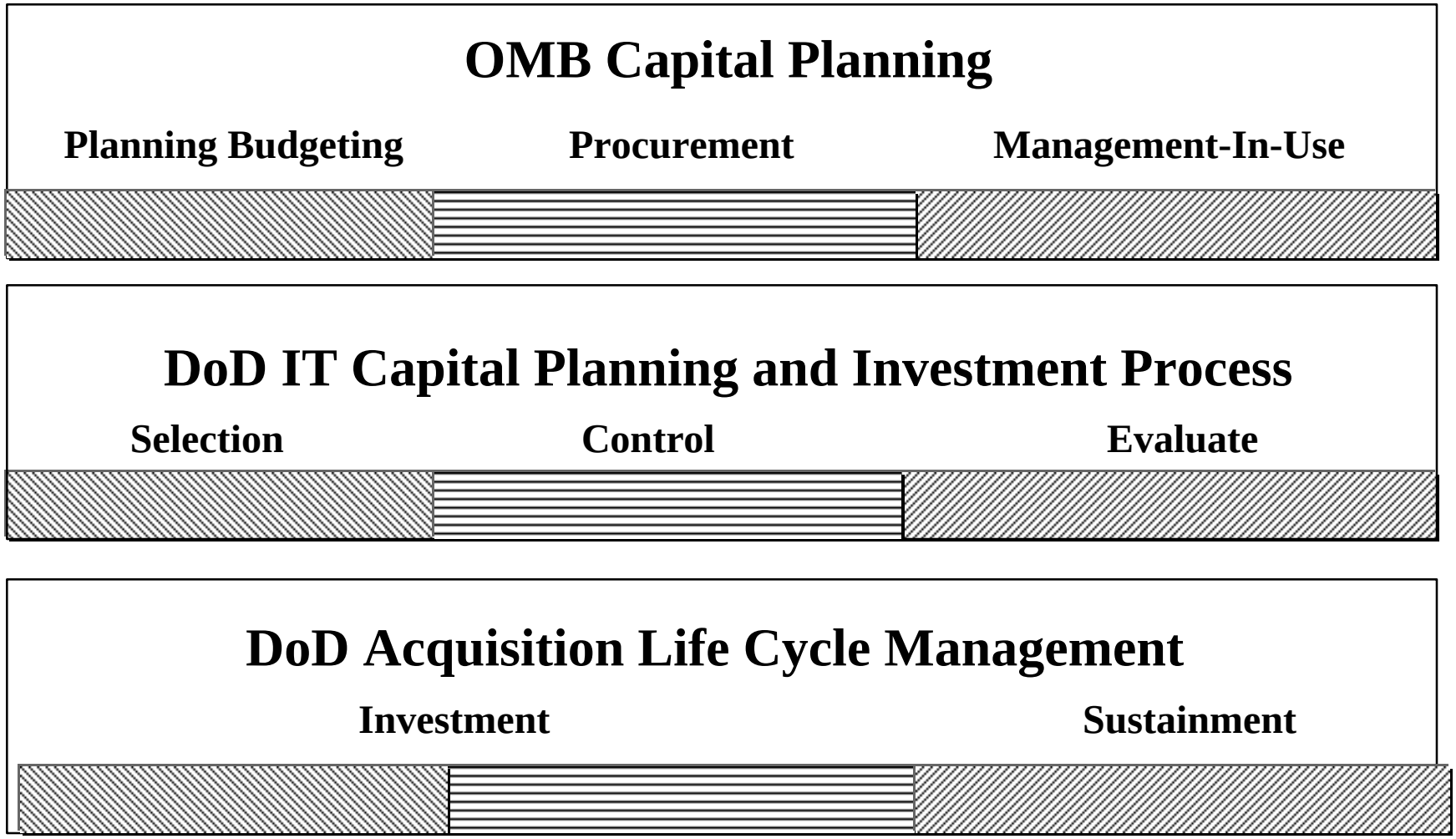
Information Technology Reform Legislation

- **Clinger-Cohen Act of 1996**
  - Formerly titled Information Technology Management Reform Act
  - Emphasis on Planning Phase and the analyses of alternatives; benefits analysis, and performance metrics
  - OMB can withhold budget until satisfied that program planning is complete

- **Paperwork Reduction Act of 1995**
  - Establish clear link between analysis of alternatives, system requirements, and system evaluation measures of effectiveness

- **Government Performance and Results Act (GPRA) of 1993**
  - Emphasis on link between DoD Strategic Plan and selected acquisition projects

Acquisition Phase Terminology



DoD 5000.2-R Updates

- Documents references to statutes
- Program goals shall be linked to the DoD Strategic Plan
- CAIV-based cost-schedule-performance tradeoffs
- To the maximum extent possible, modular contracting shall be used

Documentation Requirements

- **In theory, current MAIS process is analogous to DAB**
  - DoD 5000.2-R governs the process
  - Same cost documentation in preparation for M/S is required
  - MAIS programs required to submit MAIS quarterly reports versus SAR/DAES

- **In practice, MAIS process is not as rigid**
  - Info technology advancements tend to outpace review process
  - Documentation requirements often waived or done after the fact in response to an ADM requirement
  - Non-service military agencies do not have independent cost offices

Required Documentation

Document	Milestone 0	Milestone I	Milestone II	Milestone III
Analysis of Alternatives	**Yes**	**Yes**	No	No
Economic Analysis	No	**Yes**	**Yes**	**Yes**
CARD	No	**Yes**	**Yes**	**Yes**
CCA	No	**Yes**	**Yes**	**Yes**
Affordability Review	No	**Yes**	**Yes**	**Yes**
APB	No	**Yes**	**Yes**	**Yes**
CAIV	No	**Yes**	**Yes**	**Yes**
Metrics Development/Tracking	No	No	No	No

Potential Improvements

- **ASD(C3I) is evaluating Portfolio Management with Pilot Program**
  - Portfolio of investments for one functional area
  - Consistent with CIO philosophy
  - Delegate oversight to services

- **Modifying Cost Documentation Requirements**
  - Explore potential of reducing documentation
  - Focus resources on establishing cost baselines

Service Recommendations

- **Establish a calendar for MAIS milestones**
  - Similar to OSD Cost Analysis Improvement Group calendar for weapon systems
- **Standardize Review Process for MAIS Milestones**
- **Standardize Milestone requirements**

AIS Estimating Overview

Typical Cost Elements

Product-Orientation

- **General**: Information processing and management support systems
  - Functional Examples: Pay&personnel, procurement, messaging, medical, supply, maintenance, and troop movement
  - Systems: DIMHRS, SPS, DMS, TMIP, GCSS-AF, IMDS, TC-AIMSII
  - Many systems are joint-service programs because processes are common
- **Software**
  - Application
    - Commercial Off The Shelf (COTS), Government Off the Shelf (GOTS)
    - Custom-developed software
  - Integration
- **Hardware:**
  - Desktop computers, servers, and communication lines
  - Custom-made hardware is rare

Typical Cost Elements

Process-Orientation

- Organic Program Management
- Contractor System Engineering and Program Management
- Training Development
- Site Activation
- System Implementation
- System Operation and Support
  - Data Processing
  - Software Maintenance
  - Hardware Maintenance and Replacement

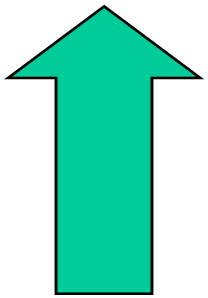
AIS Programs & the Software System Continuum

Office Utility Programs:

- Word Processing
- Spreadsheets
- Presentation S/W

Systems

Automated & Mgt. Info Systems	Command & Control Systems	Embedded Manned	Embedded Unmanned



AIS Cost Estimating Challenge
General Assessment

- **General Assessment:**
  - The biggest challenge is a lack of historical data from the development of software-intensive AIS programs
- **Issue:**
  - Lack of a central repository of data
- **Solution:**
  - Contract Cost Data Reporting (CCDR) program being considered for expansion to include AIS contractors

AIS Cost Estimating Challenge
CCDR Requirement

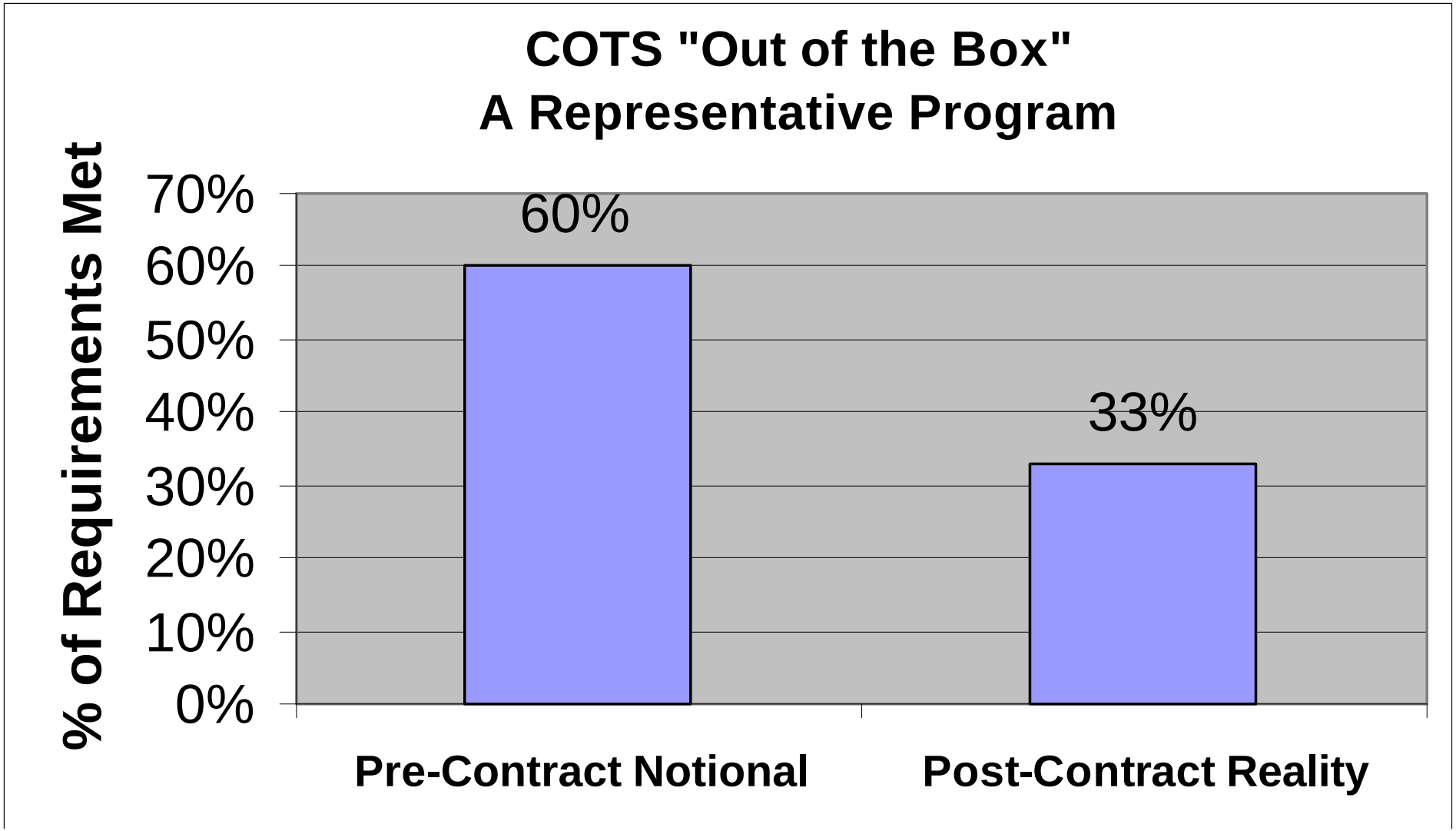
- **Contractor Cost Data Reporting (CCDR)**
  - OSD(PA&E)-led initiative that requires contractors to report cost data on weapon systems development, production, and fielding
  - To date, CCDR has not been required on AIS programs
- **New CCDR Requirement Being Considered for AIS Programs**
  - Fall 98: Service Cost Center Chiefs recommend CCDR requirement for AIS
  - Winter 99: Initial Meetings to formulate and recommend policy AIS CCDRs
- **CCDR for AIS Approach**
  - PA&E Guide (updated as appropriate) establishes foundation for cost reporting
  - Cost Integrated Process Teams to create/tailor lower-level elements
  - Detailed reporting requirements still being formulated

AIS Cost Estimating Challenge
Software

Commercial-Off-the-Shelf (COTS) Software

- **Background:**
  - Streamlining Requirements: "Use COTS to maximum extent!"
  - In theory, this makes sense. Capitalize on existing products
- **Issue:**
  - COTS Software is not a "silver bullet"
    - Requires customization or supplemental custom applications
    - Requires integration
  - Streamlining Mentality: "We use COTS, therefore we do not need cost data."
- **Solution:**
  - Recognize the pros and cons of using COTS
  - Don't haphazardly waive cost reporting requirements for COTS intensive systems
  - Put the process before the system

The COTS Reality



AIS Cost Estimating Challenge
Software

COTS Integration

- **Background**: COTS products must be integrated into overall package
- **Issue:**
  - COTS typically must meet Common Operating Environment requirements
  - There is limited information on integration costs
- **Solution:**
  - Do not undersell the cost to integrate
  - Work with technical staff to understand integration requirements
  - May become easier as DoD and industry data standards agree
  - Put the process before the system

AIS Cost Estimating Challenge
Software

Cost as an Independent Variable Application to Software Development

- **Background:**
  - AIS software is nebulous and requirements are ambiguous
  - If a program is experiencing an overrun, it is typical to defer a requirement under the auspices of CAIV and capture that requirement in a maintenance release
- **Issue:**
  - CAIV captures cost-performance-schedule tradeoffs within user-accepted bounds
  - Deferring requirements is an “out-of-bounds” process
  - Requirements deferment distorts investment cost
- **Solution:**
  - Well-defined technical requirements baseline
  - Deferred requirements should be estimated as an investment-type cost

AIS Cost Estimating Challenge
Software

Other Software Issues (Background/Solution)

- **COTS Sizing**
  - Background: Is SLOC a good proxy for sizing of COTS modifications?
  - Alternative: Develop metrics that are input-process-output related
- **COTS Licensing**
  - Background: Steep discounts available when buying COTS in quantity
  - Solution:
    - Do not use catalog prices haphazardly
    - Note: This also applies to hardware purchases
- **Software Development Schedule and Manning**
  - Background: Does adding more people to development staff reduce marginal productivity to the point that the program takes longer rather than shorter?
  - Solution: Do not build unrealistic development schedules., profiles

AIS Cost Estimating Challenge
Hardware

Hardware Requirements

- **Background:**
  - Matching hardware availability against hardware requirements
- **Issue:**
  - Can the software being developed run on available hardware?
  - Hardware typically includes personal computers, servers, and network lines
- **Solution:**
  - Need good site survey of available hardware
  - Account for application growth
  - If program drives procurement of hardware (that normally would not have been purchased otherwise) then the hardware should be costed as part of the program
  - Consider impact to other applications that run on same hardware

AIS Cost Estimating Challenge
Hardware

Hardware Phasing

- **Background:**
  - Matching software delivery with hardware delivery. This is a pronounced concern for joint service programs where one service buys the hardware and another buys the software
- **Issue:**
  - Software and hardware work as an integrated whole
- **Solution:**
  - Close synchronization among the services
  - Tend towards leading hardware ahead of software if it becomes necessary

AIS Cost Estimating Challenge
Training Development

Training Development

- **Background:**
  - Automation of process typically results in a fundamental change in business ops (or is the by-product of a change in business process)
- **Issue:**
  - Training requirements may not be met with delivery of system tech manuals
- **Solution:**
  - Put the process before the system
  - Do not undersell the cost of process training

AIS Cost Estimating Challenge
System Implementation: General

System Implementation

- **Background:**
  - Joint-service program: division of labor
- **Issue:**
  - Joint service: Implementation tasks can fall through the cracks
- **Solutions:**
  - Clearly define implementation tasks and office of responsibility
    - Site survey
    - Hardware install
    - Software install
    - Data Migration

AIS Cost Estimating Challenge
System Implementation: Data Conversion

Data Conversion

- **Background:**
  - New system must be populated with data
  - Manual data entry or feed from legacy system
- **Issue:**
  - A system that handles compliant data versus data that is actually compliant
- **Solution:**
  - Highly program contingent

AIS Cost Estimating Challenge
DISA Operations

DISA Operations

- **Background:**
  - DISA processing costs are typically treated as a pass through cost
  - DISA costs can be one of the largest cost elements
- **Issue:**
  - Ability to influence these costs may be limited
  - Ability to portray these costs is a good start
- **Solution:**
  - Understand and portray cost drivers

Summary

- There are many unique challenges of estimating AIS programs
- The OSD and HQ-level review process is being revamped to be more responsive
- We've highlighted many estimating "trouble spots" and offer some potential solutions
- We welcome any examples of progress made on estimating these systems